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Using Android Smartphones as Inexpensive Sensors

Department of Computer Science

Using Android smartphones as inexpensive sensors

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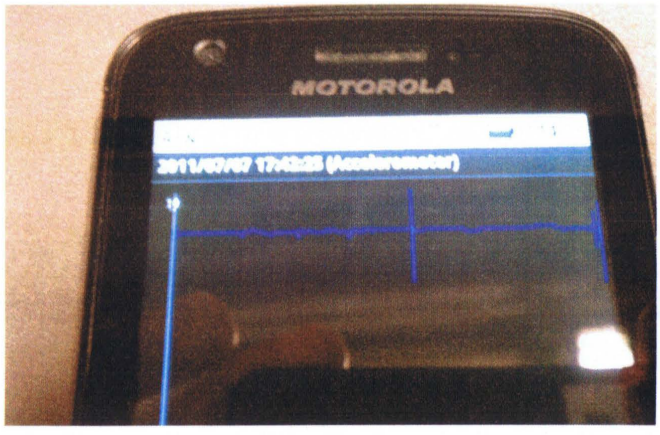
The Android phone has useful sensors

- Audio
- Average sound volume
- Camera
- Vibration sensor
- Motion sensor (infrared)
- Light sensor



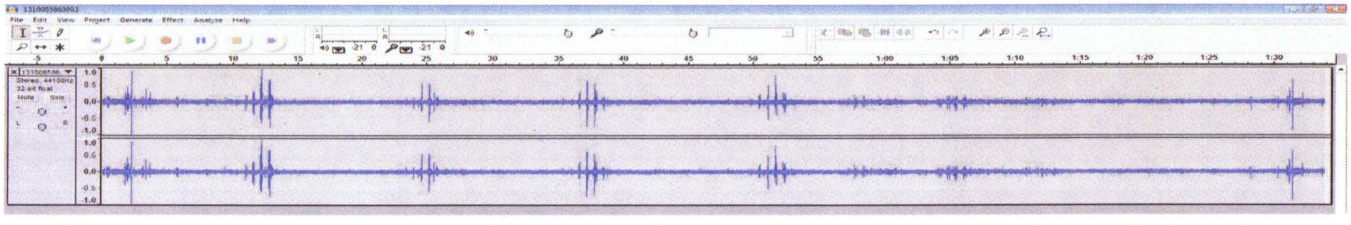
We are writing programs to detect approaching people. The goal is to replace expensive military sensors for situation awareness with cheap COTS products.

Experiments on situation awareness

- Indoor experiments: Test the sensor capabilities.
- Outdoor experiments: Need to adjust the light and infrared thresholds, and handle background noise.
- We used the Android API to write programs to analyze sensor values.
- Camera images are best way to transmit situation information, but there are limits:
  - More than one picture per second is unreasonable, so might miss a quick transit.
  - It is difficult to take pictures at a consistent rate.

Evaluation of the Android sensors for the situation-awareness task

- Audio: Need program to filter 20-100 hertz frequencies to find footsteps, looking for 0.4-1.0 periodicity.
- Average sound volume: helps some, but lots of false alarms.
- Camera: Too hard to do much image processing.
- Vibration sensor: Only useful when person is close and is not stealthy; surface material affects results considerably.
- Motion sensor (infrared): Notices people only when within a foot or so.
- Light sensor: Notices people only if they block light (but is located on the back, needs a mirror); false alarms with clouds.



Design plan

- Use weighted sum of normalized values for the sensors.
- Compare to a threshold, trigger camera if over the threshold.
- Transmit triggered images to a central location for analysis.

Conclusions

- The Android API is better and less restricted than the Iphone.
- The Android sensors are better than the Iphone sensors.
- Hence the Android appears better than the Iphone as a sensor platform.
- Using it will save much money over traditional military sensors.